# CONTENTS
## for Volume 195

No. 1, August 1998


### IMAGING AND MICROSCOPY

**Piston, David W.**
*Concepts in Imaging and Microscopy.* Choosing objective lenses: the importance of numerical aperture and magnification in digital optical microscopy ..... 1

### RESEARCH NOTES

**Hárosi, Ferenc I., Ione Hunt von Herbing, and Jeffrey R. Van Keuren**
Sickling of anoxic red blood cells in fish ..... 5

**Stuart, J. A., E. L. Ooi, J. McLeod, A. E. Bourns, and J. S. Ballantyne**
D- and L-β-hydroxybutyrate dehydrogenases and the evolution of ketone body metabolism in gastropod molluscs ..... 12

**Rodhouse, Paul G.**
Physiological progenesis in cephalopod molluscs .. 17

### DEVELOPMENT AND REPRODUCTION

**Holm, Eric R., Brian T. Nedved, Eugenio Carpizo-Ituarte, and Michael G. Hadfield**
Metamorphic-signal transduction in *Hydroides elegans* (Polychaeta: Serpulidae) is not mediated by a G protein ..... 21

### PHYSIOLOGY

**Leys, Sally P., and Henry M. Reiswig**
Transport pathways in the neotropical sponge *Aplysina* ..... 30

**Nair, P. Satish, and William E. Robinson**
Calcium speciation and exchange between blood and extrapallial fluid of the quahog *Mercenaria mercenaria* (L.) ..... 43

**Nakatani, Isamu, Yoshinori Okada, and Takuji Kitahara**
Induction of extra claws on the chelipeds of a crayfish, *Procambarus clarkii* ..... 52

### ECOLOGY AND EVOLUTION

**Ogasawara, Michio, and Noriyuki Satoh**
Isolation and characterization of endostyle-specific genes in the ascidian *Ciona intestinalis* ..... 60

**Maruyama, Tadashi, Masaharu Ishikura, Satoru Yamazaki, and Satoru Kanai**
Molecular phylogeny of zooxanthellate bivalves ... 70

### NEUROBIOLOGY AND BEHAVIOR

**Cobb, Christopher S., and Roddy Williamson**
Electrophysiology and innervation of the photosensitive epistellar body in the lesser octopus *Eledone cirrhosa* ..... 78

* * *

**Annual Report of the Marine Biological Laboratory** .. R1


No. 2, October 1998


### SYMBIOSIS

**Nyholm, Spencer V., and Margaret J. McFall-Ngai**
Sampling the light organ microenvironment of *Euprymna scolopes:* description of a population of host cells in association with the bacterial symbiont *Vibrio fischeri* ..... 89

### CELL BIOLOGY AND DEVELOPMENT

**Rinkevich, Baruch, Irving L. Weissman, and Anthony W. DeTomaso**
Transplantation of Fu/HC-incompatible zooids in *Botryllus schlosseri* results in chimerism ..... 98

# CONTENTS
## for Volume 195

No. 1, August 1998


### IMAGING AND MICROSCOPY

**Piston, David W.**
*Concepts in Imaging and Microscopy.* Choosing objective lenses: the importance of numerical aperture and magnification in digital optical microscopy ..... 1

### RESEARCH NOTES

**Hárosi, Ferenc I., Ione Hunt von Herbing, and Jeffrey R. Van Keuren**
Sickling of anoxic red blood cells in fish ..... 5

**Stuart, J. A., E. L. Ooi, J. McLeod, A. E. Bourns, and J. S. Ballantyne**
D- and L-β-hydroxybutyrate dehydrogenases and the evolution of ketone body metabolism in gastropod molluscs ..... 12

**Rodhouse, Paul G.**
Physiological progenesis in cephalopod molluscs .. 17

### DEVELOPMENT AND REPRODUCTION

**Holm, Eric R., Brian T. Nedved, Eugenio Carpizo-Ituarte, and Michael G. Hadfield**
Metamorphic-signal transduction in *Hydroides elegans* (Polychaeta: Serpulidae) is not mediated by a G protein ..... 21

### PHYSIOLOGY

**Leys, Sally P., and Henry M. Reiswig**
Transport pathways in the neotropical sponge *Aplysina* ..... 30

**Nair, P. Satish, and William E. Robinson**
Calcium speciation and exchange between blood and extrapallial fluid of the quahog *Mercenaria mercenaria* (L.) ..... 43

**Nakatani, Isamu, Yoshinori Okada, and Takuji Kitahara**
Induction of extra claws on the chelipeds of a crayfish, *Procambarus clarkii* ..... 52

### ECOLOGY AND EVOLUTION

**Ogasawara, Michio, and Noriyuki Satoh**
Isolation and characterization of endostyle-specific genes in the ascidian *Ciona intestinalis* ..... 60

**Maruyama, Tadashi, Masaharu Ishikura, Satoru Yamazaki, and Satoru Kanai**
Molecular phylogeny of zooxanthellate bivalves ... 70

### NEUROBIOLOGY AND BEHAVIOR

**Cobb, Christopher S., and Roddy Williamson**
Electrophysiology and innervation of the photosensitive epistellar body in the lesser octopus *Eledone cirrhosa* ..... 78

* * *

**Annual Report of the Marine Biological Laboratory** .. R1


No. 2, October 1998


### SYMBIOSIS

**Nyholm, Spencer V., and Margaret J. McFall-Ngai**
Sampling the light organ microenvironment of *Euprymna scolopes:* description of a population of host cells in association with the bacterial symbiont *Vibrio fischeri* ..... 89

### CELL BIOLOGY AND DEVELOPMENT

**Rinkevich, Baruch, Irving L. Weissman, and Anthony W. DeTomaso**
Transplantation of Fu/HC-incompatible zooids in *Botryllus schlosseri* results in chimerism ..... 98

**Yamada, Katsuyuki, and Koshin Mihashi**
Temperature-independent period immediately after fertilization in sea urchin eggs . . . . . 107
**Abdu, Uri, Peter Takac, Hans Laufer, and Amir Sagi**
Effect of methyl farnesoate on late larval development and metamorphosis in the prawn *Macrobrachium rosenbergii* (Decapoda, Palaemonidae): a juvenoid-like effect? . . . . . 112

## ECOLOGY AND EVOLUTION

**Bavestrello, Giorgio, Umberto Benatti, Barbara Calcinai, Riccardo Cattaneo-Vietti, Carlo Cerrano, Anna Favre, Marco Giovine, Serena Lanza, Roberto Pronzato, and Michele Sarà**
Body polarity and mineral selectivity in the demosponge *Chondrosia reniformis* . . . . . 120
**Wendt, Dean E.**
Effect of larval swimming duration on growth and reproduction of *Bugula neritina* (Bryozoa) under field conditions . . . . . 126

## PHYSIOLOGY

**Ellers, Olaf, Amy S. Johnson, and Philip E. Moberg**
Structural strengthening of urchin skeletons by collagenous sutural ligaments . . . . . 136
**Thorington, Glyne U., and David A. Hessinger**
Efferent mechanisms of discharging cnidae: II. A nematocyst release response in the sea anemone tentacle 145

## NEUROBIOLOGY AND BEHAVIOR

**Herberholz, Jens, and Barbara Schmitz**
Role of mechanosensory stimuli in intraspecific agonistic encounters of the snapping shrimp (*Alpheus heterochaelis*) . . . . . 156

## RESEARCH NOTE

**Tankersley, Richard A., Maria G. Wieber, Marco A. Sigala, and Kristen A. Kachurak**
Migratory behavior of ovigerous blue crabs *Callinectes sapidus:* evidence for selective tidal-stream transport . . . . . 168

## SHORT REPORTS FROM THE 1998 GENERAL SCIENTIFIC MEETINGS OF THE MARINE BIOLOGICAL LABORATORY

### *Featured Articles*

**Atema, Jelle**
Introduction. Tracking turbulence: processing the bimodal signals that define an odor plume . . . . . 179
**Weaver, Matthew, and Jelle Atema**
Hydrodynamic coupling of lobster antennule motion to oscillatory water flow . . . . . 180
**Guenther, Carla M., and Jelle Atema**
Distribution of setae on the *Homarus americanus* lateral antennule flagellum . . . . . 182

### *Sensory Biology*

**Mead, Kristina S.**
The biomechanics of odorant access to aesthetascs in the grass shrimp, *Palaemonetes vulgaris* . . . . . 184
**Quinn, Elizabeth, Kristen Paradise, and Jelle Atema**
Juvenile *Limulus polyphemus* generate two water currents that contact one proven and one putative chemoreceptor organ . . . . . 185
**Shashar, Nadav, Ferenc I. Hárosi, Anastazia T. Banaszak, and Roger T. Hanlon**
UV radiation blocking compounds in the eye of the cuttlefish *Sepia officinalis* . . . . . 187
**Ruta, Vanessa J., Frederick A. Dodge, and Robert B. Barlow**
Efferent modulation of physiological properties of the *Limulus* lateral eye . . . . . 189
**Edds-Walton, P. L., and R. R. Fay**
Directional auditory responses in the descending octaval nucleus of the toadfish (*Opsanus tau*) . . . . . 191

### *Behavior and Neurobiology*

**King, Jane Roche, and Hans Straka**
Effects of vestibular nerve lesions on orientation turning in the leopard frog, *Rana pipiens* . . . . . 193
**Mensinger, Allen F., and Max Deffenbaugh**
Prototype rechargeable tag for acoustical neural telemetry . . . . . 194
**Billack, Blase, Jeffrey D. Laskin, Prudence T. Heck, Walter Troll, Michael A. Gallo, and Diane E. Heck**
Alterations in cholinergic signaling modulate contraction of isolated sea urchin tube feet: potential role of nitric oxide . . . . . 196
**Hoskin, Francis C. G., and John E. Walker**
A closer look at the natural substrate for a nerve-gas hydrolyzing enzyme in squid nerve . . . . . 197
**Kuzirian, Alan M., Herman T. Epstein, Thomas J. Nelson, and Nancy S. Rafferty**
Lead, learning, and calexcitin in *Hermissenda* . . . . . 198
**Tamse, Catherine T., Katherine Hammar, D. Marshall Porterfield, and Peter J. S. Smith**
Transmembrane calcium flux in $Pb^{2+}$-exposed *Aplysia* neurons . . . . . 201
**Malchow, Robert Paul, Michael P. Verzi, and Peter J. S. Smith**
Extracellular pH gradients measured from isolated retinal cells . . . . . 203
**Andersen, Kristen A., and Robert Paul Malchow**
Fluorometric analysis of intracellular sodium concentrations in isolated retinal horizontal cells . . . . . 204
**Jessen-Eller, Kathryn, Marjorie Steele, Carol Reinisch, and Nicholas Spitzer**
Blockade of ryanodine receptors stimulates neurite outgrowth in embryos of *Spisula solidissima* . . . . . 206

*Cell and Developmental Biology*

**Porterfield, D. M., J. R. Trimarchi, D. L. Keefe, and P. J. S. Smith**
Characterization of oxygen and calcium fluxes from early mouse embryos and oocytes ..... 208

**Silver, Robert B., Leslie A. King, and Alyssa F. Wise**
Calcium regulatory endomembranes of the prophase mitotic apparatus of sand dollar cells contain enzyme activities that produce leukotriene $B_4$ but not 1,4,5-inositol triphosphate ..... 209

**Lee, Kyeng G., Nishal Mohan, Zoya Koroleva, Li-Fang Huang, and William D. Cohen**
Fluorescence localization of cytoskeletal proteins in fibrin-trapped cells ..... 211

**Goda, Makoto, Shinya Inoué, and Robert Knudson**
Oocyte maturation in *Chaetopterus pergamentaceous* observed with centrifuge polarizing microscope ... 212

**Miyake, Katsuya, and Paul L. McNeil**
A little shell to live in: evidence that the fertilization envelope can prevent mechanically induced damage of the developing sea urchin embryo ..... 214

**Kuhns, William J., Xavier Fernandez-Busquets, Max M. Burger, Michael Ho, and Eva Turley**
Hyaluronic acid-receptor binding demonstrated by synthetic adhesive proteoglycan peptide constructs and by cell receptors on the marine sponge *Microciona prolifera* ..... 216

**Kubke, M. F., E. Gilland, and R. Baker**
Lipophilic dye labeling distinguishes segregated central components of the eighth cranial nerve in embryonic chicken ..... 218

**Straka, Hans, Edwin Gilland, and Robert Baker**
Rhombomeric organization of brainstem motor neurons in larval frogs ..... 220

*Animal Husbandry and Disease*

**Hanley, Janice S., Nadav Shashar, Roxanna Smolowitz, Robert A. Bullis, William N. Mebane, Howaida R. Gabr, and Roger T. Hanlon**
Modified laboratory culture techniques for the European cuttlefish *Sepia officinalis* ..... 223

**Maxwell, Michael R., William K. Macy, Shobu Odate, and Roger T. Hanlon**
Evidence for multiple spawning by squids (*Loligo pealei*) in captivity ..... 225

**Weidner, Earl, and Teresa King**
*In vivo* and *in vitro* growth of nerve parasite from *Lophius americanus* ..... 227

**O'Neill, Maureen D., Heather M. Wesp, Allen F. Mensinger, and Roger T. Hanlon**
Initial baseline blood chemistry of the oyster toadfish, *Opsanus tau* ..... 228

**Smolowitz, Roxanna, Elizabeth Wadman, and H. M. Chikarmane**
*Pseudomonas putida* infections of the oyster toadfish (*Opsanus tau*) ..... 229

*Ecology*

**Schmitt, Catherine, Nathaniel Weston, and Charles Hopkinson**
Preliminary evaluation of sedimentation rates and species distribution in Plum Island Estuary, Massachusetts ..... 232

**Griffin, Martin P. A., Marci L. Cole, Kevin D. Kroeger, and Just Cebrian**
Dependence of herbivory on autotrophic nitrogen content and on net primary production across ecosystems 233

**Rogers, Jennifer, Jennifer Harris, and Ivan Valiela**
Interaction of nitrogen supply, sea level rise, and elevation on species form and composition of salt marsh plants ..... 235

**Sweeney, Jennifer, Linda Deegan, and Robert Garritt**
Population size and site fidelity of *Fundulus heteroclitus* in a macrotidal saltmarsh creek ..... 238

**Kirkpatrick, John, Ken Foreman, and Ivan Valiela**
Dissolved inorganic nitrogen flux and mineralization in Waquoit Bay sediments as measured by core incubations ..... 240

**Graham, Suzanne, Jessica Davis, Linda Deegan, Just Cebrian, Jeff Hughes, and Jennifer Hauxwell**
Effect of eelgrass (*Zostera marina*) density on the feeding efficiency of mummichog (*Fundulus heteroclitus*) ..... 241

**Legra, Jessica C., Roselle E. Safran, and Ivan Valiela**
Lead concentration as an indicator of contamination history in estuarine sediments ..... 243

**Safran, Roselle E., Jessica C. Legra, and Ivan Valiela**
Effects of nitrogen loading on eelgrass seed coat abundance, C to N ratios, and $\delta^{15}N$ in sediments of Waquoit Bay ..... 245

**Costello, John H., and Rebecca Coverdale**
Planktonic feeding and evolutionary significance of the lobate body plan within the Ctenophora ..... 247

*Abstracts*

**Papers listed by title only** ..... 249

No. 3, December 1998

## RESEARCH NOTES

**Mankad, Raj V., Alexander A. Gimelbrant, and Timothy S. McClintock**
Consensus translational initiation sites of marine invertebrate phyla ..... 251

**Bishop, Jamie J., Thomas L. Vandergon, David B. Green, Jeannette E. Doeller, and David W. Kraus**
A high-affinity hemoglobin is expressed in the notochord of amphioxus, *Branchiostoma californiense* .. 255

**Stach, Thomas**
Coelomic cavities may function as a vascular system in amphioxus larvae ..... 260

PHYSIOLOGY

**Ellington, W. Ross, and Stephen T. Kinsey**
Functional and evolutionary implications of the distribution of phosphagens in primitive-type spermatozoa 264

NEUROBIOLOGY AND BEHAVIOR

**Linser, Paul J., William E. S. Carr, Holly S. Cate, Charles D. Derby, and James C. Netherton III**
Functional significance of the co-localization of taste buds and teeth in the pharyngeal jaws of the largemouth bass, *Micropterus salmoides* . . . . . 273

**Webster, S. G.**
Peptidergic neurons in barnacles: an immunohistochemical study using antisera raised against crustacean neuropeptides . . . . . 282

CELL BIOLOGY

**Nowel, Mark S., P. M. J. Shelton, and P. J. Herring**
Cuticular photophores of two decapod crustaceans, *Oplophorus spinosus* and *Systellapsis debilis* . . . . . 290

DEVELOPMENT AND REPRODUCTION

**Ram, Jeffrey L., Carlos S. Gallardo, Michal L. Ram, and Roger P. Croll**
Reproduction-associated immunoreative peptides in the nervous systems of prosobranch gastropods . . . . 308

**Sakai, Kazuhiko**
Effect of colony size, polyp size, and budding mode on egg production in a colonial coral . . . . . 319

**Montgomery, Mary K., and Margaret J. McFall-Ngai**
Late postembryonic development of the symbiotic light organ of *Euprymna scolopes* (Cephalopoda: Sepiolidae) . . . . . 326

ECOLOGY AND EVOLUTION

**Johnsen, Sönke, and Edith A. Widder**
Transparency and visibility of gelatinous zooplankton from the northwestern Atlantic and Gulf of Mexico 337

**Pernet, Bruno, and Alan J. Kohn**
Size-related obligate and facultative parasitism in the marine gastropod *Trichotropis cancellata* . . . . . 349

GENETIC REGULATORY NETWORKS IN EMBRYOGENESIS AND EVOLUTION

**Cameron, R. Andrew**
Introduction . . . . . 361

**Henry, Jonathan Q., and Mark Q. Martindale**
Evolution of cleavage programs in relationship to axial specification and body plan evolution . . . . . 363

**van Loon, A. E., and J. A. M. van den Biggelaar**
Changes in cell lineage specification elucidate evolutionary relations in Spiralia . . . . . 367

**Shankland, Marty, and Ashley E. E. Bruce**
Axial patterning in the leech: developmental mechanisms and evolutionary implications . . . . . 370

**Akam, Michael**
Hox genes in arthropod development and evolution 373

**Slack, Frank, and Gary Ruvkun**
Heterochronic genes in development and evolution . . 375

**Hobert, Oliver, and Gary Ruvkun**
A common theme for LIM homeobox gene function across phylogeny? . . . . . 377

**Satoh, Noriyuki**
Mechanisms of specification in ascidian embryos . . . 381

**Published by title only** . . . . . 384

**Chairs and speakers** . . . . . 384

1997–98 PHOTOGRAPHY AND PHOTOMICROGRAPHY CONTEST

**Prize-winning photographs** . . . . . 387

* * *

**Index for Volume 195** . . . . . 391